

REMARKS

In the Office Action the Examiner objected to Claims 1, 7 and 8 because of the following informalities: Claim 1 there is a space between C_6 and H_9O in the Formula M^E , in the definition of (b), the word “seklected” is misspelled; Claim 7, the word “rges” should be “ranges” and Claim 8 “(a” should be “(a).”

In response applicant has corrected the space between C_6 and H_9O , the misspelled words “seklected” and “rges” have been appropriately amended to recite “selected” and “ranges” and “(a” has been amended to “(a)” in the Claims 1, 7 and 8, respectively.

In the Office Action Claim 1, was rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the applicant regards as the invention because in the definition of component (d), the formula of the alkylphenol compound is missing making it unclear what “R” and “b” are referring to.

In response applicant has amended section (d) of Claim 1 to include the formula $R_b - C_6H_{5-b} - OH$ representing the alkylphenol compound, thus clarifying what “R” and “b” refer to. Applicant respectfully submits that the amendments to the claims are fully supported by the originally filed specification and that no new matter has been added.

Turning to the substantive matters at hand, the Examiner rejected Claims 1-23 under 35 U.S.C. §103 as being obvious over Eckberg et al. U.S. Patent No. 5,814,679 (“Eckberg” or “Eckberg `679” or “the `679 patent”) in view of Desorcie et al. U. S. Patent No. 5,010,118 (“Desorcie” or “the `118 patent”).

Reconsideration is respectfully requested in view of this amendment.

The present invention is directed to an ultra-violet or electron beam curable silicone coating composition comprising a epoxy-terminated linear silicone, bearing reactive functional groups at the chain-stopper position but not at other positions along polymer chains, a carbinol functional silicone, an alkylphenol additive and compatible iodonium salt photocatalysts. The novel silicone compositions provide *unexpectedly stable photocurable* compositions that can be readily applied to conventional substrates. The novel compositions can be efficiently cured to adhesive coatings on exposure to ultraviolet light. The compositions of the present invention, when coated and cured, also provide for unique and useful release properties and release performance from conventional pressure sensitive adhesives (PSA's) in the form of tapes or labels.

Applicants respectfully submit that the applied prior art does not disclose such novel compositions. Specifically, the present amended claims are novel and unobvious over Eckberg '679 because, *inter alia*, Eckberg '679 describes *improved lower release force* photocured epoxysilicone coatings that are prepared through the use of a carbinol containing siloxane, a photo-catalyst and an epoxy functional polydiorganosiloxane that is *not* limited to epoxy-terminated linear silicone, bearing reactive functional groups at the chain-stopper position, as presently claimed.

Eckberg '679 teaches the use of certain mono- or poly- carbinol functional silicone additives to conventional poly-epoxy functional silicone polymers (normally of structures where reactive cycloaliphatic epoxy groups are present along linear polymer chains as well

as in chain-stopper positions). These additives, when of a linear polydimethylsiloxane structure end-capped by chainstopper groups that include the carbinol (or poly-carbinol) functionality, modify the release performance of the photocured silicone coatings derived therefrom by making release both lower and smoother, and by reducing the coefficient of friction of the cured coating. Moreover, nowhere in Eckberg '679 is there any suggestion or motivation to use (poly)carbinol silicone - containing silicone coating mixture as a one-part shelf stable composition. Specifically, Eckberg '679 teaches novel silicone polymers that are useful for modification of release performance without regard to effect on catalyzed life.

The presently amended claims are based on the discovery that certain low molecular weight linear polydialkylsiloxanes bearing reactive cycloaliphatic epoxy functional groups only at the chain-stopper position to provide for unexpectedly long catalyzed shelf life in combination with carbinol functional silicone, an alkylphenol additive and compatible iodonium salt photocatalysts produce unexpectedly stable photocurable compositions. The epoxy resins claimed herein have structures identified as $M^E D_x M^E$, $M^{GE} D_x M^{GE}$, $M^E D_x M^{GE}$ and mixtures thereof, wherein $M^E = (C_6H_9O(CH_2CH_2)(CH_3)_2SiO_{1/2})$, $M^{GE} = (CH_2(O)CH)O(CH_2)_3(CH_3)_2SiO_{1/2}$ and $D = (R^1)_2SiO_{2/2}$, and $x = 0$ or a positive integer and the epoxy-terminated silicone polymer has a viscosity ranging from about 10 to about 1000 centistoke at 25°C and R^1 is a C1 to C60 monovalent hydrocarbon radical.

In sharp contrast, Eckberg '679 describes large epoxy functional silicones with reactive cycloaliphatic epoxy groups that are present along linear polymer chains as well as in chain-stopper positions and are identified as: $MD_x D_y^E Q_z T_u D_j^{Rf} D_k^A D_l^P (D'(CH(R)CH_2$

$(O)_m)_n D_p^B M$; $M^E D_x D_y^E Q_z T_u D_j^{Rf} D_k^A D_l^P (D'(CH(R)CH_2 O)_m)_n D_p^B M^E$; $M^E D_x D_y^E Q_z T_u D_j^{Rf} D_k^A D_l^P (D'(CH(R)CH_2 O)_m)_n D_p^B M$; and mixtures thereof. $M=(CH_3)_3 SiO_{1/2}$, $M^E=(C_6 H_9 O(CH_2)_2)(CH_3)_2 SiO_{1/2}$, $D=(CH_3)_2 SiO_{2/2}$, $D'=((CH_3)(CH_2)_g)((CH_3)(CH_2)_h)SiO_{2/2}$, $DE=(C_6 H_9 O(CH_2)_2)(CH_3)SiO_{2/2}$, $D^{Rf}=(CF_3 CH_2 CH_2)(CH_3)SiO_{2/2}$, $D^A=((HO)(C_2 H_3 COO)C_6 H_9 (CH_2)_2)(CH_3)SiO_{2/2}$, $DP=((HO)(C_6 H_4)(CH_2)_3)(CH_3)SiO_{2/2}$, $D^B=((C_6 H_5 COO)(HO)(C_6 H_9)(CH_2)_2)(CH_3)SiO_{2/2}$, $Q=SiO_{4/2}$, $T=(CH_3)_3 SiO_{3/2}$. Wherein R is selected from the group consisting of hydrogen, methyl, and ethyl, and where j, k, l, m, n, p, x, y, z, and u are positive integers and g, h, k, l, n, p, u and z may be zero or positive integers and the epoxy functional silicone has a viscosity ranging from about 100 to about 100,000 centistokes at 25 C⁰.

Moreover, Eckberg's disclosure is limited to the use of carbinol functionalized silicones to improve the release properties of epoxy silicones photo-curable release compositions by co-photo-curing with the epoxy functionalized silicone.

Applicant has presently discovered that when the alkylphenol diluted epoxy-terminated plus carbinol-stopped silicone polymers are combined with a miscible bis-aryl iodonium catalyst, the resulting mixture possesses a very long useful shelf life.

The Examiner attention is directed to the instant application wherein Tables 2, 3, 4 and 5 disclose shelf life comparison studies at 40°C, 60°C, 70°C, and 25°C for various novel combinations of polymers disclosed therein. The compositions of the present invention contain epoxy-terminated linear silicone, bearing reactive functional groups at the chain-stopper position, carbinol functional silicones, alkylphenol additive and bis(4-dodecylphenyl) iodonium hexafluoroantimonate. The control silicone polymer is a commercially available

polyepoxy-functional dimethylsilicone polymer. As such, the control polymer includes numerous reactive cycloaliphatic epoxy groups along its polymer chain while the inventive compositions have reactive sites only at chain ends.

The instant application differs from the cited prior art in a number of important ways. The instant application teaches the use of a specific type of reactive silicone polymer whose reactive groups, cycloaliphatic epoxy, are sited only at chainstopper positions to provide for unexpectedly long catalyzed shelf life, even at elevated temperature. As the amended claims make clear, the best results are obtained when the epoxy-terminated silicone polymer is of a preferred chainlength; too short a polymer chain does not give good release performance; too long a polymer chain slows cure and reduces iodonium catalyst miscibility. While the instant application includes alkylphenol diluent to further improve 'onium salt compatibility and thus making the catalyzed mixture more usable, the presence or absence of this ingredient does not impart long shelf life and is not key to the invention. The inventive process of the instant application is the use of silicone polymers whose reactive groups are exclusively sited at chain-stopper positions, thus effectively preventing crosslinking and rapid viscosity build of catalyzed coating formulas which is not taught or suggested by the cited prior art.

In this regard, the Examiner suggested that it would have been obvious to one skilled in the art at the time of the invention to employ the "compatibilizer" for an epoxy silicone and iodonium salt comprising an alkylphenol disclosed by Desorcie. The '118 patent teaches the use of alkylphenol and aliphatic diol reactive diluents as solubilizing agents in photocurable epoxysilicone based release coatings permitting use of certain 'onium salt

catalysts (sulfonium and iodonium species) that are either nontoxic or of very low toxicity. Absent these diluents the particular 'onium catalysts described in Desorcie are immiscible in epoxysilicone polymers. Further, nowhere in the Desorcie disclosure is there any reference to shelf life, either long or short. While Desorcie teaches photocurable, photocatalyzed epoxysilicone release agents that include alkylphenols, for example, it should be noted that bis(4-alkylphenyl) iodonium antimonate, the catalyst of choice in the one part product application, is in fact soluble in many epoxysilicone polymers, e.g. General Electric commercial products UV9300 and UV9315, without additional alkylphenol or other diluents. Such blends do not constitute one part shelf-stable UV cure release coatings, however, since the epoxysilicone polymers are multi-epoxy functional silicones prone to crosslinking in the presence of the 'onium salt their useful shelf life is reduced.

Applicant respectfully submits that for the reasons presented above, Claims 1-23 are patentable over the applied art.

Reconsideration and allowance by the Examiner of amended Claims 1-23 as presented herein are once again respectfully requested.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Peter G. Dilworth", is written over the typed name.

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